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# INTERNAL URETHROTOMY,

WITH ITS

MODERN IMPROVEMENTS.



BY

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## PREFACE.

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THE merits of internal urethrotomy were fully discussed by the author, in a paper read by him before the Manchester Medical Society, in April last; and he now describes those details of the operation which will render it applicable to every variety of finely-contracted urethra.

Hitherto, surgeons seem to have directed their attention more to the relief of stricture than to its cure; it is the author's hope that a careful perusal of this essay may lead to the latter result being the more frequent consequence of such treatment.

22, SAINT JOHN STREET,

MANCHESTER, JULY, 1877.



## INTERNAL URETHROTOMY.

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HOW perseveringly the ingenuity of surgeons has been directed towards perfecting every process and every instrument used in the operations of lithotomy and lithotrity becomes evident when we consider what has already been accomplished with this object. We need only contemplate the many ways in which it has been proposed to open the bladder; the many instruments which have been invented for grasping the stone and securing its ready and safe removal; the great variety of contrivances designed for crushing the stone previous to its extraction from the bladder, or for dislodging a fragment of it when fixed in the urinary outlet; or lastly, the variety of lithotrites, from the vice and drill of Heurtelop, to the delicate and neatly balanced instruments of modern design. So with the modes of treating those contractions of the urinary canal which are technically called strictures of the urethra. If surgeons who practised forty years ago, with metallic instruments of massive proportions for the immediate dilatation of the urethra, could see some of the thread-like bougies which are now employed in the treatment of what they would have pronounced impermeable strictures, they would most certainly declare that it is not possible to pass such pliable instruments along the entire length of the urethra, or to be confident that they ever enter the interior of the bladder.

Certain improved methods of treating stricture may now be considered to be fairly recognized; and the success which attends some of the most recent methods is another proof of the earnestness with which the subject has been studied, and pursued in all its details.

In describing the surgical management of this disease I shall confine my remarks to that form of procedure known as Internal Urethrotomy, and respecting which Sir Henry Thompson has said—"Throughout my experience I have found nothing so efficient, so safe, and so certain." I hope to be able to show, by the history of a case which I shall briefly describe, that internal urethrotomy with its modern improvements is an operation deserving more general adoption by surgeons than it has hitherto received. With regard to the term

"impermeable stricture," I would remark also, at the outset, that I accept without comment, the observation of the late Prof. Syme, viz., "No stricture can be said to be impermeable through which "urine escapes in however small a stream." Supposing that even only one or two drops occasionally pass by the urethra, and that the remainder of the secretion be voided through fistulæ, this circumstance alone proves that the natural channel is not perfectly obliterated, and that "patience and olive oil" may yet ensure a successful result. From my own recent experience in such cases, I shall never again despair of ultimate success if time can be allowed for the proper treatment of the case. I assume, of course, that the patient's constitutional powers are not so greatly impaired, and that the retention of urine is never so excessive, but that the bladder can relieve itself, even if only by fistulous passages; so that absolute permanent distention can be avoided, and thus that the canal can be restored to its normal state, provided certain fixed principles of treatment be carefully observed. These principles it will now be my endeavour to define and illustrate in as practical a manner as possible.

I must first refer to an erroneous impression as to the etiology of stricture, which I believe has influenced our surgical practice injuriously, and which has special reference to the causation of these deformities of the urethra. The notion in times past was, that the canal became contracted by the deposition of lymph or other organisable matter in the submucous tissue, pushing the lining membrane inwards towards the centre, and thus causing a diminution of the size of the passage at some given spot. It was common, in fact, to say that stricture might be regarded as just such a change in the capacity of the urethra as would be represented by tying a piece of string round the outside of a compressible tube. This of course would only completely close the tube if the string were very tightly tied; while a slighter degree of compression would produce only a corresponding diminution. This being the theory of the cause of stricture, the erroneous conclusion based on it was that the passage remaining open was central, assuming of course that the canal was not wholly obliterated. And certainly, if the contractile force, acting centripetally from all points of the circumference of the tube, had been insufficient to close the sides absolutely, the chances are that the passage still remaining would be central, or very nearly so. In the introduction of an instrument through such a contracted part, an endeavour would therefore be made to seek for the centre of the canal, and even if difficulty were experienced in passing any foreign body through it—a bougie or a catheter—the



operator would still persevere in a central direction. But, in truth, looked at pathologically, the canal of the urethra is very rarely contracted in a centripetal manner. These deformities of the urethra are almost invariably the result of cicatricial changes resulting from previous inflammation, ulceration, loss of tissue, and subsequent cicatrisation. Thus, supposing from any cause—most generally the cause is excessive inflammation, as in the progress of gonorrhœa—one or more spots of the urethra become the seat of these changes, say over the orifice of a lacuna on the patient's right side, a puckering of the urethra would be produced at this spot as soon as the healing process was finished. This would force or drag the healthy mucous membrane opposite to it from the left side of the canal in such a way as to produce a divergence of the line of the passage. A little further on, in some other portion of the urethra, it is quite possible that similar changes, if advanced to the same degree, might operate only on the opposite side, and here it would be found that the passage would run on the other side of the urethra; and this process might be repeated many times in the same subject, producing the sites of separate strictures. When an attempt is made to pass an instrument along a urethra so damaged, it is quite evident that if the instrument be formed of some unyielding material, like hard gum-elastic, or whalebone, or a totally inflexible one, such as silver or steel, by no possibility can we cause it to travel first to one side and then to the other in a sinuous course; and we therefore feel, at once, that in the treatment of stricture, if the contraction has become excessive, rigid and unpliant instruments will never serve as safe dilators of so delicate a passage as that with which we have to deal. Of course in the division of strictures into two chief classes, traumatic and organic, the one the result of injury, and the other, as may be assumed, a consequence of previous inflammation, it might be said that it is quite intelligible how, in a urethra deformed by injury, the passage should be drawn or twisted out of a straight line; but it is not generally admitted, or at any rate it is rarely remembered, that to a miniature degree, exactly the same changes occur in a stricture developed under the more usual circumstances, and which is called organic.

It is true the spots of injured membrane are not so extensive in the latter as in the former case, but still they are of the same nature, that is to say, they have been produced by the loss of normal tissue, and the substitution for it of new material, which, in accordance with its conduct in all other parts of the body, will here exhibit that insensible and constant tendency to contract which we observe distorting parts

where cicatrices are visible. Consider, for example, what happens in the cicatrix of a burn. However carefully we may have treated such a case, if the surface which has been destroyed be replaced by new tissue, we know how that new tissue will certainly produce, in the course of time, a permanent contraction of the part; this is often observable on the surface of the body. The principle is the same, whether we watch the cicatrix of a burn between the arm and the fore-arm in front of the elbow, by which a fixed position of the joint shall follow, or whether we only trace a similar change in a spot of cicatricial tissue upon the urethral membrane, not exceeding a quarter of an inch in area. Hence it is that, in the history of strictures which have followed inflammatory action, as in gonorrhœa, to say nothing of those which have their origin more directly from injury, in the traumatic variety, immediate deformity of the canal is not to be detected. The truth of the old remark is thus confirmed, that a man who contracts gonorrhœa at twenty draws a bill upon his constitution payable at forty; in other words, it is not for nearly twenty years after recovery from his inflamed urethra that he is made conscious of the slow contraction of cicatrices which year by year have narrowed the passage to a permanent degree, and rendered his urethra almost impassable to ordinary instruments. All the while, no doubt, nature has been doing her utmost to augment the contractility of the bladder, so as to propel the urine through the narrow passage. The very tortuous configuration of a strictured urethra is for all practical purposes a fact never to be lost sight of in the treatment of this malady. It is for this purpose that the ends of our bougies are made conical and very gradually tapering, so that when they are introduced into the canal they may by their pliability quickly accommodate themselves to the windings of the passage, and be pushed without resistance into its smaller portions. And here it is very important to recollect that we gain much by using instruments in which the conical extremities increase in thickness very slowly: for, if they be too abruptly fashioned, instead of entering any contracted portion they will press against the front part of it where the cicatrix exists; and if urged on too forcibly will be apt to strip from the surrounding membrane the hardened tissue, and then the point of the instrument may pierce the dilated and weakened part beyond, producing the first condition of what is called a false passage: whereas if the cone be gradual, without any sudden projection, the narrowest portion of it will easily enter the contracted ring-like piece of the urethra, and the act of pushing it on will give to it all the power of a wedge-shaped dilator. In the delicate filiform French

Plate 1

A



B



C



D







bougies the points are made to enlarge too rapidly from size to size. With similar instruments of English manufacture the scale is arranged in twelve divisions, and of these English bougies there are only twelve sizes, whereas of French bougies there are twenty-four sizes, in the first ten of which the cones increase too abruptly. It would, in my opinion, be much better if the conical points of the smaller flexible bougies of each scale were made of uniform size, the cone being increased in length with the increase in size of the cylindrical portion of the instrument; and thus, although this part of the bougie would be greater in No. 10 French than No. 1, the extreme point in all would remain of uniform size. By this arrangement we should be sure that as we proceeded with the use of any of the larger bougies the dilating cone was fairly within the ring or grip of the stricture, and not abutting against its anterior part. I have ordered such bougies, with conical ends of increasing lengths according to the size of cone, to be made by Messrs. Mayer and Meltzer. Mr. Cock, who wrote many years since in the Guy's Hospital Reports on the general treatment of stricture, made the very pertinent remark that he believed that in many cases of confirmed stricture in which a very small instrument was said to have passed through a stricture, it had, in truth, not done so; but that as soon as the point of the instrument had reached the narrow, indurated part of the canal, it failed to enter this collar or ring, and slipping by the side of it, pierced the urethra in front, and in many cases entering the dilated canal behind the stricture, then passed onwards into the bladder. He considered, in fact, that the stricture had never been traversed by the instrument which was credited with relieving the patient. It might be thought that the presence of hæmorrhage from the urethra, when an instrument is passed along it under such circumstances, would reveal the degree of the laceration which had occurred; and it might be said that if a fine instrument can be passed along the whole length of the urethra without producing any bleeding, no such complication has occurred. On the other hand, I would not wish to assert that in every case in which we pass a fine instrument completely into the bladder, and this is followed by the loss of a few drops of blood "*per urethram*," the instrument has pierced the walls and produced a false passage, for it may have been simply from abrasion of the very vascular mucous surface. No doubt it is this tortuous form of the canal, where a stricture is present, which has led surgeons to adopt one of two methods of passing fine instruments, to which I will now refer. The first is a very useful plan of bending the extreme point of a filiform bougie slightly to an angle for the extent of an eighth or a

quarter of an inch, as shown in Plate I., Fig. B. This may be done easily when the instrument has been softened by dipping the end of it in warm water, and afterwards plunging it into cold water before using, or even by holding it for a few minutes between the finger and thumb, when the warmth of the hand will be sufficient. The peculiar shape of the extremity of the bougie here referred to has this effect; when the bougie is passed down the canal, proper care being taken to prevent the point entering any of the small lacunæ, the extreme point of the bougie will press in a spring-like manner more against the wall than against the middle of the passage; whereas, if the instrument were quite straight it would be more likely to strike only against the centre.

Now if from the puckering of the mucous membrane a little of it has been drawn across the axial centre of the canal, and the straight instrument falls upon this portion of it, the membrane might serve as a pouch, and impede its progress, and if much force were used the wall might be torn or pierced. But by using a fine instrument with a point bent as I have described, *coudée* or elbowed, the point slides over the projection like a wedge, and with a little care it may be made to enter the side passage, which is the only pervious spot in the strictured part. Of course it must always be a matter of uncertainty in our first explorations of a urethra on which side this passage lies. It may be, as Sir Henry Thompson has so well expressed it, "on any one of the four "cardinal points," in front, behind, or on either side. We should therefore in our first examination of a strictured urethra with a fine instrument, if it is thought proper to use one, direct the point say to successive spots on the left side, where I think I have observed that cicatrices are more frequently present than on the right. Failing to pass it there, we ought to withdraw it for a short distance and turn it round until we know the point will strike diametrically on the opposite side. Here we change the pressure, and it may pass or not, according to circumstances. If this does not succeed we again withdraw it for a short distance, directing the bent point of the instrument along the floor of the canal rather than the upper or dorsal wall where so many lacunæ are situated. Here possibly we may gain a passage, and poising the instrument very delicately in the fingers, we may observe that the part of the bougie which remains outside the urethra is quite straight, indicating that no great onward force is used; or, this failing, we repeat the attempt upon the upper wall of the urethra. These little manipulations being carefully performed, and a passage discovered, we note that at each particular part of the urethra the instrument must be directed to a certain side of the passage, and as often as we repeat the operation

time will be saved if the information previously obtained be carefully acted upon. I have gone so far in my demonstrations to students in the hospital on this mode of passing these filiform bougies, as to map out, in imagination, on the glans penis the four points of the compass; and to say, as the bougie was passed along the passage—"It must now be steered due south, or south-east, or due north," as the case might be.

Beyond this first stricture there may be a second, or even a third, in which the pervious portion of the canal is in different directions, and this can only be discovered by repeating the process. For it is curious to observe, when we are passing these fine instruments, that if they are held very lightly and urged on with just sufficient force to secure their passage without bending them, they will be felt to twist round in the fingers in a sort of spiral manner, suggesting to the operator the presence of those changes in the line of the canal which I have mentioned, and that the tube which we are exploring is like the rifled barrel of a gun in which there exist many heliacal turns. On the same principle, some surgeons, in place of using a fine bougie with an angle or elbow-bending at the point, soften the bougie in warm water until it is quite pliable, then roll it into a spiral form round a small piece of wire or a bougie, immerse it in cold water for an instant to set it in this form, and when it is introduced into the urethra, make it rotate in various directions until these tortuous passages are followed and the bladder is reached. My own experience inclines me to prefer the angular point to the spiral twist. But here I must refer in passing to a practical difficulty in the use of these fine filiform bougies, which I am sure all who have used them must have occasionally experienced;—it is this, that after passing such an instrument, say a No. 3 French for two or two and a half inches, its further progress is completely arrested. Do all we can, turn it as we may, it will pass no further; and that we employ enough force, if not too much, is proved by the curving of the bougie outside the urethra and the spring-like recoil which occurs in it as soon as we cease to press. Now the question is, what stops its progress? Is it that the point or far end of the bougie has caught in some fold or lacuna or depression in the mucous membrane, or is it that really the smallest part of it is in the grip of the stricture, and is there held by mere tightness? Should this be the case two things would occur: on gently trying to remove the bougie, it would be found to be fixed or held by the grasping of the narrowed portion of the canal, which it fits and distends to the utmost; and next, on attempting to draw it out, there is resistance so long as it remains



in the strictured part; the resistance then suddenly ceases, the bougie starts back, its hold is released, and it is drawn straight out of the canal with its original form very little if at all altered. On the contrary, if the resistance had been near the point of the bougie, the instrument could not have been advanced, and the angular curve would have become flattened, or in some way distorted or curled back upon itself. In this latter case all we can do is to remove the bougie and again attempt to pass it with greater care; in the former case, where the resistance comes of the too rapid increase in the size of the bougie, either at its shoulder or conical part, which is too short, or in the cylindrical portion, we use a similar instrument of smaller size, and if we again succeed, leave it awhile in the stricture, and after an hour or so try to push it on for a further distance. I may here remark that I am decidedly opposed to the forced dilatation of stricture under any circumstances, and that where excessive retention of urine exists, the operation most easy of performance, if the diagnosis be correct that the bladder is really full, is the supra-pubic paracentesis, slipping through the canula an elastic tube or catheter, which can be retained in place of the canula for a few days, until further progress has been made in dilating the stricture.

It is to the cautious, persevering use of very small filiform bougies, that I would attach the greatest value in the preliminary treatment of what used to be called impermeable strictures. No time should be accounted as wasted during which we proceed with their use. Success is sure to attend the effort of the surgeon in this direction if he will proceed cautiously, and he will then have confidence in all subsequent proceedings, knowing that he is in possession of the true line or course of the urethra. I have assumed that no force is used, and that the mucous membrane not being lacerated, no fresh injury can result. The difficulty of course is to pass the filiform bougie, and to avoid its entanglement in all the recesses and nooks and corners of the urethra. There are two methods of avoiding these impediments, either of which will occasionally succeed. The one is to pass down the urethra as far as the first obstruction, a urethral tube of gum-elastic open at each extremity, and holding it firmly at the spot, to slip the filiform bougie along the interior; then very carefully manipulating, first withdrawing the tube a little, so as to expose a certain length of the fine bougie, and then pressing the tube for a short space, we may at last succeed in passing the bougie and withdrawing the tube. What we thus gain is simply that any false passages or recesses in the urethra are protected from entrance up to the spot where we believe the stricture really exists.



The other plan, which with patience generally answers well, is to introduce a fine bougie until it is held by some resisting spot. Being satisfied that it cannot be urged on further, take another bougie of equal fineness, pass it cautiously along the floor of the urethra, and if it be observed to pass further than the other, it will often glide into the bladder, the former one having blocked the dilated lacuna, or the false passage in which it had been caught. For this purpose I now use the very long whalebone filiform bougie, 18 to 20 inches in length, first suggested by M. Phillip, of Paris, and my object is, either by the urethral tube or by the block system to get it with certainty into the bladder. And here I may say that nothing but practice, and the education of a light hand and delicate touch, can convey to the operator the thorough conviction that such a small instrument as this is going in a right course without appreciable resistance, until at last it coils itself up within the bladder to one half its length. I then slide over it the finest silver tubular catheter I can procure;—Mr. Coxeter has made me one equal to No. 3·5 French scale. It is open at both ends and uniformly cylindrical throughout. Into this catheter I inject two or three drops of carbolated oil by means of a fine Anel's syringe, so as thoroughly to lubricate the interior and render it properly aseptic. Threading this delicate tube over the long slender strip of whalebone already in the bladder, it is possible, with a little coaxing—by alternately propelling the catheter, and at the same moment withdrawing the bougie a short distance, then reversing the movement, drawing back the catheter, and replacing the bougie—at last to pass the catheter through all the strictures and lodge it in the bladder. Then removing the bougie, we get a few drops of urine to flow through it and this clears up all doubt.

In my next proceeding I think I have made some advance on the time needed in the treatment of such cases. I screw into this tubular catheter a steel rod, and then, by a series of sliding tubes on Wakley's system, I there and then dilate the stricture up to a No. 3, or even a No. 4, English measure. I can now pass an elastic catheter, and the patient can rest until further operation is decided upon, or we can proceed forthwith to divide the urethra. In this way I have, on several occasions, after weeks of continuous work, at last succeeded in passing the whalebone bougie, then dilated the stricture and performed urethrotomy, so that a No. 17 bougie à ventre, or a No. 14 silver catheter, has been passed along the urethra of a patient in whom, only a few hours previously, the permeable portion of the urethra would only admit a No. 3 or 4 French bougie.

In the preliminary treatment of confirmed stricture which I now advocate so strongly, it will often be needful to refrain from touching the urethra for many days at a time. The passage where it exists is so very minute, and generally so vascular, that the irritation from the contact of the fine bougie will almost certainly create some swelling, which will still further close the passage. The patient will say, soon after he has removed the filiform bougie, that he can produce a much fuller stream of urine; but in a few hours, or certainly the next day, this is again diminished in volume from the cause I have assigned. Or it may take two or three days to subside, and then further attempts may be made to pass, if not a larger, at least the same sized instrument; the great point being in all such cases to note that with increase of size in the bougie we pass, the patient should express himself as being relieved, and enabled in some degree, however slight, to pass the urine more freely; for there cannot be a more positive sign that it is not the normal channel of the urethra, but a false passage, which we are dilating, than that the patient does not admit easier micturition as a result of passing the larger instrument.

In these remarks as to the formation of stricture at points of old cicatrices, I am not forgetful of the practical value, as a question of prognosis, of arranging all strictures of the urethra into two classes as far as extent is concerned,—the ring-stricture and the tunnel-stricture. In the ring-stricture the length of the contracted portion of the canal is very slight. When we have to treat such a stricture, and we succeed in passing an instrument through it, as soon as the instrument has fairly got possession of the aperture it can be made to start or jump through it with great readiness; but in the tunnel-stricture, in which the contraction is of some considerable length—say eight or ten times its diameter—the instrument is sure to be held, and firmly so, in its passage. There are many ways of measuring the exact length of strictures, but I do not think they can be said to be practically of much service. The chief point to be determined in each case is whether we have to deal with a short contraction or a long one. In what are called traumatic strictures—those which are clearly traceable to previous injuries from blows and falls on the perineum—in which the injured portion is usually situated near to the membranous part of the urethra, the contraction will be generally very complete and surrounded by much indurated tissue. These are the most serious forms of stricture, because in their origin they are the most obviously cicatricial, and if, either from ignorance or neglect, the contraction has been allowed to become permanent, they are the most difficult to treat; and therefore

I would wish to confine the application of internal urethrotomy chiefly to such cases as those in which the stricture is very advanced, leaving the slighter deformities and contractions of the canal to the more simple treatment by progressive dilatation.

I will now proceed to invite attention to certain other things, the importance of which, if not denied by surgeons, is not perhaps so often observed as it ought to be, and by which our treatment is not unfrequently embarrassed. I refer in the first place to the great importance of rest in the preliminary treatment of every case of severe stricture of the urethra. If a man has his urethra so contracted that it is not possible to pass an instrument of larger calibre than a No. 2 or 3 English catheter, the disease is sure to increase in severity so long as the patient is allowed to follow his ordinary employment, walking and standing during many hours of the day; with all those risks of exposure to changes of temperature, and still worse, if of intemperate habits, the being subject to sudden calls upon the secreting powers of the kidneys, which by sympathy as well as by continuity of structure, tend to irritate and inflame the urinary passages. It is true that there are many who from circumstances over which they have no control are compelled to go about their daily avocations with a stricture of these dimensions; yet the way in which they now and then, by some unforeseen cause, become subject to retention of urine, with all the agony and distress which this condition involves, should at least be a warning to us to protest, in the management of such cases, against any other plan than that of perfect mechanical and physiological rest. It is interesting to notice in such cases as these, if we can once get the patient to stay in bed for a time with the object of obtaining, if possible, a permanent cure of his malady, how quickly, after a few days of perfect rest, with increased action of the skin and decreased action of the kidneys, together with the use of diluents and slight saline aperients, he can pass his urine in a much larger stream than he had previously, and yet without any instrumental assistance. It is of great importance in clinical teaching to insist upon the observance of these hygienic measures apart from, but in addition to, what may be called the mechanical means of cure, since it will always aid our future instrumental interference to allow a patient with a contracted and inflamed urethra to rest a few days under these more favourable circumstances, before any attempt is made to pass an instrument. In this disease, as in many others, we are apt to have our judgment influenced by the urgent solicitations of our patients to hurry on the treatment, because they grudge the time we ask for success; and



not only in hospital practice but still more in private practice, it might sometimes seem as if we were wasting valuable time if in the treatment of stricture, which is generally supposed to be purely a mechanical process, we postpone from day to day any attempt to pass an instrument until the congestion of the parts shall have in some measure subsided. But when the time arrives, after this complete repose, it will be gratifying to note how easily a suitable instrument will pass, where these preliminary measures have been strictly enforced.

Strictures are often spoken of in surgical works as congested, inflamed, and irritable,—terms all to a certain degree applicable to individual cases, yet all depending upon a general condition of increased vascularity, and this vascularity of the strictured surface of the urethra is rather of a venous than an arterial nature. It seems to me of the greatest importance to remember the close communication which exists between the veins surrounding the neck of the bladder, and those which form a network near the lower portion of the rectum;—in other words, to keep in mind the free communication which exists along all the venules of the hæmorrhoidal and the prostatic plexus of veins, so that any loaded condition of the sigmoid flexure or of the rectum, with a tendency to hæmorrhoids, will of necessity increase the vascularity of the mucous membrane of the urethra, while all such remedies as diminish the one will lessen the other; and that in the preparatory treatment of a case of narrow stricture, it is absolutely necessary to unload the veins of the lower bowel and to diminish as far as possible anything approaching pelvic plethora. This can be done best—and I think in every way most easily—by the use of a combination of a saline aperient, such as the sulphate of magnesia, with a simple non-irritating diuretic like the nitrate of potash. Half a drachm of the former with 10 grs. of the latter, and half a fluid drachm of spirits of sweet nitre in an ounce of water twice or thrice a day will have a most beneficial effect, and act more gradually and more continuously than occasional large doses of aperients, such as the Seidlitz powder or any of the more fashionable mineral waters.

Again, the plan which has been recently advocated in cases of complete retention, of puncturing the bladder above the pubes and thus rapidly removing the urine—so that in such a case, only a few hours after the operation, a small catheter which previously would not pass the contracted portion of the urethra can then be introduced, or even a larger size than would have been thought possible—has on more than one occasion been a matter of astonishment to me. The way in which I would explain the action of it is this, that in cases of retention,

when the bladder has become so full of urine that it has risen above the pelvis into the abdominal cavity, the pressure of the contained fluid, or the elongation of the neck of the bladder, has produced an impediment to the ready emptying of the prostatic plexus of veins to which I have referred, and an increased congestion of the mucous membrane of the urethra is the consequence, with a more thorough closure of the canal. After the bladder has been emptied by the trochar and canula, this pressure taken off and the circulation relieved, there is a subsidence, however, of the congestion, with increased freedom of the canal; thus verifying in a manner almost mechanical the correctness of the theory to which I refer as to the production of one at least of the effects of over fulness of the veins in these parts. It must not be forgotten that, in most cases of finely contracted stricture, the lining of the bladder becomes inflamed, and more or less cystitis is present with, in the more protracted cases, mischief in the kidneys themselves; and the urine which has to travel through the diminished canal of the urethra very frequently becomes ammoniacal and very acrid, thus keeping up the inflammatory action in the mucous surface. It is not possible for urine which has become alkaline by long detention in the bladder to pass over the surface of the urethra without producing considerable irritation, so that if we can dilute the urine by increasing the amount of its watery portion, and render it less irritating, or, by some other medicated treatment secure its normal acidity, we shall, by this means alone, spare the surface of the urethra much continued irritation.

By way of illustrating the subject of this paper in a practical form, I will relate the general outlines of a case of chronic stricture, treated after this manner, which has recently been under my care. It is that of a patient aged about 45, who, through careless living in early life and neglect of systematic medical and surgical treatment, had, he assured me, from the age of eighteen to the present time—a period of nearly 27 years—never ceased to have a muco-purulent discharge from his urethra. How many fresh additions of the disease he may have had since he first contracted gonorrhœa, and how far his system may also have been slightly affected by the poison of constitutional syphilis, I cannot say, but when I was first consulted by him there were no visible signs of anything which could be called secondary syphilis. Yet I was told that, for more than a year previously—and it is now just one year since I first saw him—he had been confined to his bedroom, and almost entirely to bed, by what was pronounced to be impermeable stricture of the urethra, so that at no time did he pass more than a few drops of urine *per viam naturalem*; at least he says that at no time during

the last five or six years can he recollect ever passing urine in what might be called a stream, the flow being always drop by drop. When I first saw this case the only way in which the bladder was emptied was through five fistulous openings in the perineum, the upper part of the thigh, and the scrotum. Through three of these openings the urine flowed readily, not in the way of incontinence, but in such a manner that, whenever a desire for micturition occurred, straining efforts being made, the urine rushed out generally through three of these passages. Occasionally one of the three might be stopped up, and then the two other supplementary ones might come into action. The perineum was thickened, the line of the urethra was of cartilaginous hardness, the scrotum indurated, and a hard mass existed on the internal and upper part of each thigh, chiefly on the left side. The penis itself was the subject of chronic œdema durum, the prepuce for a time being perfectly non-retractile, and every evidence of chronic balanitis and intense hyperæsthesia of the glans penis with copious discharge of mucœ-purulent matter from the urethra and orifice of the prepuce. He was subject to obstinate constipation, and very frequently had attacks of urethral fever, brought on by the blocking up of one or more of the fistulæ which I have already mentioned. He had, to a very unusual degree, a tolerance of retention of urine which I have never seen in any similar case. In spite of all the mischief on the exterior of the body, and this complete contraction of the natural urethral passage, he could retain his urine for many hours with very little inconvenience. I think (before I began my treatment) he could hold it for six hours, and that after six or eight weeks it was not unusual for him to retain water for eight hours at a time. In fact it was only by allowing a large quantity to accumulate that he could so exert pressure on the bladder as to force the urine through the resisting fistulæ; he told me that having been the subject of disease in the urethra for so many years, he had accustomed himself to retain his urine for long periods, and that from the early age of 18 or 20 he had felt so much pain in passing urine, that he had postponed the act as long as possible. I had reason to believe that in this case, strange to say, in spite of so much chronic mischief, the bladder and kidneys were comparatively healthy, and on this assumption from the first I founded a very hopeful prognosis. The amount of albumen in the urine was very slight, not more than might be derived from the mucœ-pus, which also was not excessive, and the specific gravity was at all times good, being rarely below 1·018 for the average of 24 hours. The case was placed in my hands almost for a last chance, it being thought there

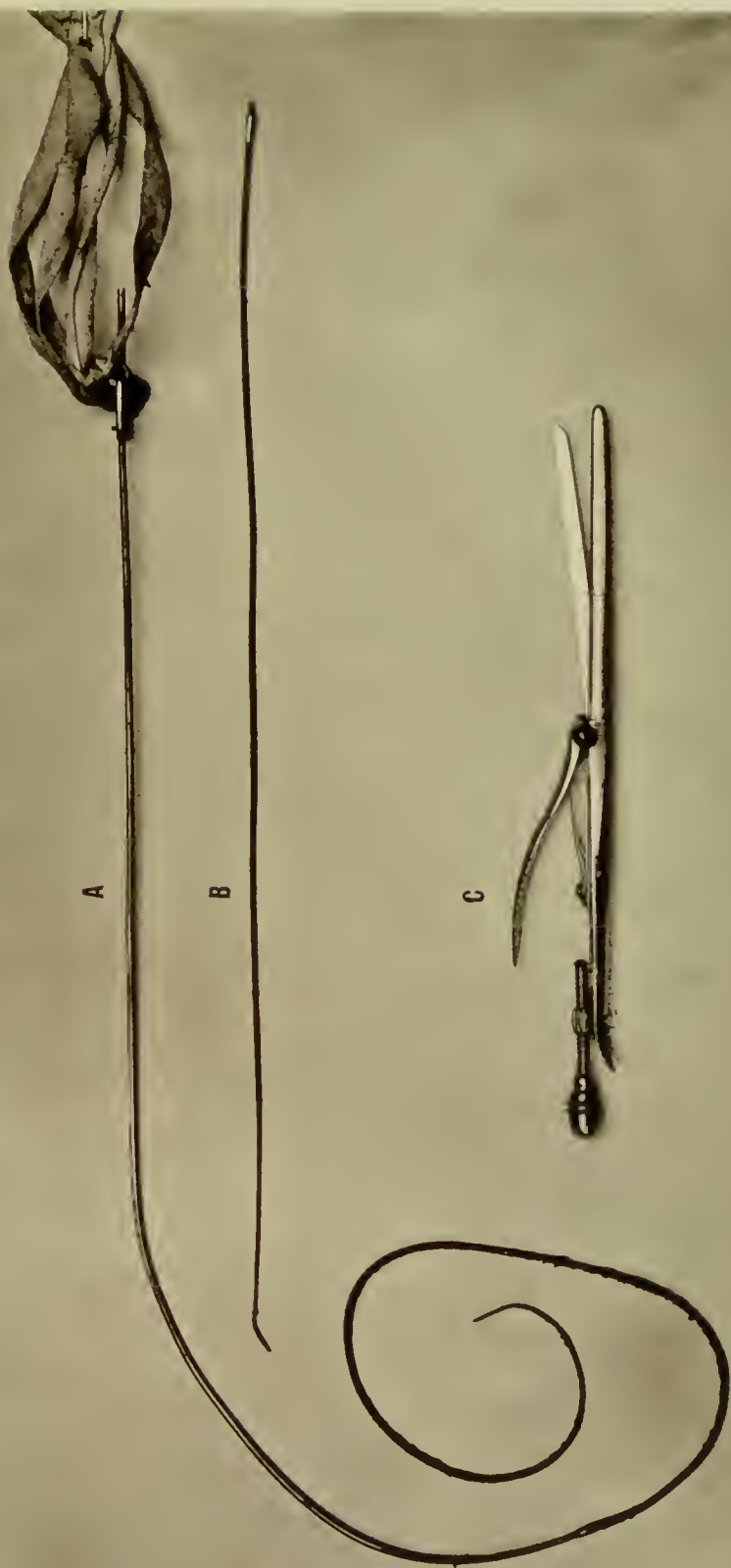


was nothing that could be done but some operation upon the perineum of the nature of Syme's perineal section; yet, even in this case, the difficulty would have been the impermeability of the urethra, which would have necessitated some form of section without guide. As I have said, the patient had been bedridden for more than twelve months when I first saw him. He was greatly emaciated, extremely nervous and irritable, utterly intolerant of pain and opposed to the idea of any cutting operation; and, as the sequel will show, refusing chloroform as certain death. He had a peculiar mode of passing urine which may be described to illustrate the severity of the case. He had had constructed a very large sort of wooden chest, something like a huge night-commode, in which was a large zinc pail; and placing himself upon the seat of this chest he supported himself on his hands, the pelvis was raised mid-air, and thus getting the greatest straining power possible, as in the old delivery-chair of the Egyptians, he would expel the urine, somewhat as if it were passing through the holes in the rose of a watering pot, by three or more of the five fistulous openings. His sufferings at times were very acute, and no doubt the use of stimulating diuretics, alcohol in many forms, and other remedies, had tended to excite the genito-urinary organs and to increase the mischief. The first expedient to which I resorted when I first saw this case was not, as might have been supposed, to explore the exact state of the urethra, but to try to diminish the inflammation which surrounded it. I used in the place of linseed poultices and such appliances, a lotion of lead and opium on folded lint covered with oiled silk, entirely encasing the perineum, the scrotum, and the penis, generally applying the same as far as he could tolerate it to those parts where there existed the most hyperæsthesia, as at the orifice of the prepuce and the glans penis. In order to avert as far as possible the attacks of urethral fever to which he was liable, I placed him immediately on large doses of quinine, about two grains with one grain of compound rhubarb pill, at first every four or five hours, until a very gentle unloading of the bowels had commenced, and then less frequently; but throughout the whole treatment of the case this was the aperient I employed. I occasionally supplemented it, at his own request, with a small dose of blue pill, followed by a Seidlitz powder, or a dose of granulated citrate of magnesia. It was not until more than a week after my first visit that I made any attempt to examine the urethra. I then used a No. 1, and next a No. 2 conical French bougie, the exact sizes of which are represented in Plate I., Figs. A and C, but could only introduce them a very short distance down

the urethra—about an inch and a quarter. Here there seemed to be a decided obstruction, which by no possibility could I overcome; but some days afterwards I discovered that by using great care in directing the point of the instruments to the floor of the urethra, they could be passed more than twice that distance. I therefore concluded that in the first instance the bougies entered the lacuna-magna on the upper wall, and that a passage was available on the lower wall for a further distance. Here, however, there seemed to be an almost perfect adhesion of the sides of the canal. The irritation produced even by this trifling operation, and the unfortunately persistent way in which my patient resisted all my entreaties for him to submit to any operation under chloroform, caused immense delay in the preliminary treatment of his case. It was not for many weeks that I was enabled to dilate the front portion of the canal inch by inch with the smallest French bougies I could procure; and subsequently by means of a bougie made of very fine catgut, which I allowed to remain in the canal for a short time after each application. Some little advance was made about this time, but it was many weeks before I had any reason to believe I had reached the bladder with the finest instruments I could procure. The contraction having taken place to a great degree in the spongy portion of the urethra, and there being a great length of strictured membrane, I soon found from the cartilaginous rigidity which was left after the somewhat acute inflammatory changes had subsided, that I could make no advance without some form of internal incision, but the urethral passage was so extremely small, and the cartilaginous hardness so intense, that it would never admit a larger bougie than a No. 3 French, and that for a short distance only. I therefore requested Mr. Coxeter to make for me (what he assures me is) the smallest urethrotome he has ever made; it is shown on Fig. D, Plate I., and measures  $2\frac{1}{2}$  inches in length, the diameter of the outer tube being equal to a No. 2 French bougie, the sliding knife with a triangular point travelling in a groove making it up to a No. 4 French. On a certain day, after many entreaties that he would take chloroform, having placed my patient under the influence of that anæsthetic, I passed the small catgut bougie down the urethra until it nearly reached the membranous portion, beyond which I could not get it. I then slid over it the tubular portion of this small urethrotome until it had traversed the canal about  $2\frac{1}{2}$  inches, and removed the cat-gut which had thus acted as a guide for the tube. I passed the small knife down the groove in the tube, and with a saw-like action divided the upper wall of the urethra for about  $2\frac{1}{2}$  inches, so far as to



Plate 2





enable me to pass a long steel probe into the urethra and break down the adhesions, which gave way in this manner like so many threads or bands. I was now able to pass a No. 4, and at last a No. 6 bougie, English scale, nearly to the membranous part of the urethra, but no further. I then proceeded to explore the urethra with several French bougies, but without success, and next with Sir Henry Thompson's No. 1 catheter, the point of which I could get just into the grasp of the stricture in the membranous portion; but it was impossible, without using force which would have lacerated the canal, to do more on this occasion. After this I passed a urethral tube, equal to a No. 8 English, for about three inches down the canal, intending to use it as a guide for a smaller instrument in any subsequent attempt. I tied this in the urethra, and on my next visit, when the patient had recovered from the effects of the chloroform, he told me that he had passed his water through the tube much more freely than he had ever done for the past twelve months, yet when I came to see for myself it was hardly a stream, but merely drop by drop, and that was all. The tube was left in the urethra for a few days, during which time I passed several small French bougies, carrying them through the tube, which served as a sort of railway catheter. My patient had so strong an antipathy to chloroform that it was many weeks before he would consent to undergo a second operation. During this interval I succeeded in keeping the urethra open by the occasional introduction of the tube and its retention for a short time, exploring the parts beyond it by a fine bougie. On one or two occasions, although the urethra seemed so spongy and soft that I feared lest I might produce laceration, I succeeded, without any blood being lost, in conducting a No. 2 French bougie along the whole length of the urethra entirely into the bladder. This I repeatedly tried to do, but could very rarely succeed—only two or three out of eight or ten attempts being successful. Whenever I did succeed I allowed the fine bougie to remain in as long as he would bear it, rarely more than a quarter of an hour at a time; but I could never pass a larger size than a No. 3 French, and I had no hollow instrument of the same size. My patient being very nervous and still adverse to taking chloroform, he was content to go on for many weeks, only voiding (by the help of the slight dilatation I had effected) a very small proportion of the urine per urethram, nine-tenths always flowing through the sinuses, which were still quite pervious. Early in the month of last September he had one of those sudden attacks of retention of urine from which he had previously so often suffered, caused no doubt by sudden swelling and closure of the fistulæ.

I was sent for in great haste to see him, and found him in much agony from complete retention of nearly 24 hours duration. Fortunately I had with me Dr. William Roberts' set of small trochars and canulæ. I immediately punctured the bladder above the pubes with one of these instruments, and drew off nearly a pint of alkaline foetid urine, which gave him instant relief. This was on the 5th September, and four days afterwards, while he was under chloroform, I discovered that the congestion of the urethral tissues had greatly diminished by free escape of urine through the canula which was retained in the bladder as well as by the fistulæ. Encouraged by these results I next resolved to try to use the bougie conductrice suggested by M. Maisonneuve, of Paris, in extreme cases of stricture; that is, to pass if possible a small flexible bougie into the bladder, and then attach to it a very fine silver catheter, for which it will act as a guide. On the end of this pilot bougie or ferret there is a screw to fix it to the catheter. (See Plate II., Fig. B). I took every precaution in the one I employed that the screw end should be firmly riveted to the flexible bougie, so that in withdrawing it from the bladder there should be no chance of its breaking off.

The arrangements being complete, and my patient under chloroform for this the second time, I proceeded to pass the pilot bougie along the urethra. Some considerable distance down the urethra, however, the bougie was arrested in its progress; if it really had caught in the lacuna magna, the pouch must have been a very long one, judging from its distance from the orifice of the urethra, yet further it would not go. I then thought of the happy expedient which I have described of retaining this bougie in the lacuna while I tried to pass another of similar size, also mounted with a screw end, by the side of it, and this I succeeded in doing after careful manipulation, carrying it along the length of the urethra fairly into the bladder. Then screwing on the silver portion of Maisonneuve's instrument, I pushed it gently into the bladder, and shortly afterwards had the gratification of seeing a few drops of urine escape through it, proving its presence there. This fine instrument, which in its measurement is equal only to a No. 1 English, was retained in the bladder by tapes, &c. until the 11th September, when chloroform was again administered, the catheter and bougie were removed, and presented the curious form shown in Plate 2, Fig. A, where it will be seen how the pilot bougie which forms the front of the instrument had become curled up while lying in the fundus of the bladder. After successive dilatations a No. 4 English flexible gum catheter was introduced in its stead. Having gained so great an advance, I was content to leave my



*Plat.* 3





patient in this improved condition for six days, the catheter being kept pervious by daily syringings with warm water. Finally, on the 18th of September I withdrew this catheter, passed the grooved guide for Mr. Teevan's internal urethrotome, and completed the operation of internal urethrotomy. The improvement from this date, as might be imagined by those who have watched such cases, was excellent; rapid restoration to a healthy condition of the tissues of the scrotum and perineum, together with the gradual yet absolute closure of all the fistulæ, were results which exceeded my most sanguine anticipations; and now within a few weeks of the date of this report, I can pass into the bladder with perfect ease a No. 12 English silver catheter. Very little hæmorrhage followed the operation, and the urethra was left free without any tube or catheter in it. Having emptied the bladder by means of an ordinary No. 10 catheter, my patient recovered from the chloroform, and passed his urine for the first time about six hours after the operation with but little smarting pain. On the second day after the operation I repeated the passage of the bougies of sizes No. 13 and 15 of the English scale. This was done at increased intervals of three, six, and eight days, till the 15th November, when I allowed so long a period as two weeks to intervene. No sooner had the urethra acquired this capacity than the urine flowed freely along it,—the sinuses healed,—the cedematous state subsided; and, as I have said already, my patient made a complete and rapid recovery.

The points to be noticed in the history and progress of this case, are chiefly the following:—The chronic urethritis unrelieved (according to his statement), often re-excited by fresh contagion, had kept up in the urethral canal a state of chronic irritation over so long a period as from the 18th to the 47th year of his life; the mucous membrane of the passage having no doubt been ulcerated over and over again at various parts, countless cicatrices and contractions had resulted. It was in this state that from fear of pain in voiding his urine over so inflamed a surface, he had contracted the habit of being able to retain it during exceedingly long periods, coupled with the fact (almost unique in its nature) that no cystitis had been set up, and also, I believe, no structural mischief in the kidneys, so that in this case there seemed to be the odd combination of extreme local injury as the result of inflammatory changes, and yet hardly any permanent organic lesion of bladder or kidneys. This made me peculiarly hopeful of ultimate success if I could so manage the case as to reach the stage in which I should be justified in performing the internal urethrotomy I have just described. But, as it seems to me, for this purpose it is extremely desirable not

to have any active urethritis present at the time of such surgical interference; and still less, any sub-acute inflammation, for in my experience of internal urethrotomy I have known of one instance in which death with pyæmic symptoms followed the operation, but here the urethra had been recently acutely inflamed at the time of the section, for while under the preliminary treatment, in which I had dilated the urethra so as to admit a No. 3 French bougie, the patient absented himself from my observation for a period of eight weeks, in which he contracted a second attack of gonorrhœa; and I doubt not in this way there was a direct absorption of irritating and poisonous matter as soon as the line of incision was made by the urethrotome, and no doubt the whole system became poisoned from this local source. It is therefore very desirable in every case to secure as far as possible the subsidence of any previously active inflammation of the urethra. No doubt in every case of chronic stricture the narrowed portion of the canal, being exposed to a greater amount of pressure and friction from every stream of urine, will be thrown from time to time into a state of high vascularity, and thus, almost as if it were from a mechanical cause, a state of inflammatory congestion will be kept up, and from such surfaces we have much of the urethral discharge so common in cases of stricture. Thus, by rest, by the use of saline aperients, as I have already stated, with diluents and careful diet, we should endeavour in every case of treatment preliminary to the operation of urethrotomy, to get the urethral canal into as quiet a state of action as possible. Then as to the treatment of the strictured portions of the canal so as to prepare for the passage of the grooved guide of the urethrotome, it is very important to dilate the passage which already exists, as a remnant of the natural channel; in other words, to make the dilatation by means of fine instruments so gradually and so cautiously introduced that if possible no false passages shall be established, and that when the time arrives for the passage of the guide on which the section is to be made, the urethrotome shall travel along a line as nearly as possible corresponding to the original course of the urethra. Now it is well known that in dilating a urethra so contracted as to be pronounced almost impermeable, this dilatation can only be brought about by the exercise of great care and patience. There are not many cases in which the dilatation can be made uninterruptedly progressive, that is to say, where the number of the fine bougie we use to-day, say a No. 3 French, can be followed with certainty in a few days by a No. 4; for here and there it will happen—from slight congestion, the precise cause of which we cannot divine—that the canal becomes more swollen and the passage smaller,



and on arriving at a certain degree of dilatation, we are rebuffed by finding that we have to retrace our steps and be content with a smaller sized instrument than we have previously used,—so that in the dilatation of a contracted urethra by this cautious method, much time and perseverance are needed, and, if rashness be allowed to predominate, laceration of the delicate membrane is certain to occur. In the case I have taken as the text or type of this paper, I was compelled to act cautiously, for my patient was so alarmed at anything like the appearance of hæmorrhage from the urethra, that I do not think half-a-dozen drops of blood escaped from it during the whole time he was under the preliminary treatment.

And now I would say a few words on the special merits of the urethrotome which I employed in this case, which I have used in several other cases, and which was first placed in my hands by my friend Mr. Teevan. It may be said to be an instrument on the principle of Maisonneuve's urethrotome with Teevan's improvements. It divides the stricture from before backwards, cutting the urethra along its upper wall, and by contact of the shields, which conceal the cutter when not in action, we ascertain the existence and position of each contracted part of the canal; thus all needless division of the delicate mucous membrane in the healthy parts of the urethra is completely avoided. As the sheathed blade of the instrument, Plate III., Fig. A, is passed along the urethra, as soon as a narrow part is reached the urethrotome is arrested in its progress by the protecting sheaths, and it cannot be passed onwards until the stricture has been divided. Now, it will be found that the actual girth of the sheaths between which the knife is placed is equal to rather more than the circumference of a No. 12 or 14 silver catheter, so that, after the section has been made where the sheaths will pass with the knife between them, a catheter of this size will also go. The obstruction being thus discovered, and the impossibility of propelling the instrument any further being evident, the knife is pushed forward, the stricture is divided by it, the knife re-sheathed, and this portion of the instrument again passed on. This process of first presenting the non-cutting part of the instrument against the strictured portion of the urethra, protruding the cutter and retracting it, and pushing the instrument onwards, must be repeated as many times as may be needful, until the whole length of the canal, at these successive stages, has been made of one uniform capacity. This being done, and the sheathed cutter fairly passed on into the bladder—care being taken that the knife is re-sheathed after each resisting portion of tissue has been divided—the urethrotome is with-

drawn, in which process no obstacle should be experienced if the sections have been properly made and all the fibres of the cicatrices have been thoroughly divided. I then introduce, in accordance with instructions received from Mr. Teevan, a solid metallic bougie-à-ventre, measuring in its thickest part a circumference equal to a No. 26 French or a No. 17 English catheter. This, with a little care, can be easily done if the point of the bougie be kept well down against the floor of the urethra so as to avoid the wound on its upper wall, and when this has passed into the bladder it will have stretched, or even torn through, any stray fibres of the contracting tissues which may have escaped division by the cutting instrument. The conical wedge-like figure of this bougie-à-ventre is seen in Plate III., Fig. B, and is remarkably well adapted for effecting this complete expansion of the canal to a degree fully up to the size of the largest English catheter,—far beyond the required capacity of a healthy urethra.

The hæmorrhage which follows this form of internal urethrotomy has never been serious in the cases in which I have operated, but the most probable seat of it, if very excessive, would be either the front part of the urethra near to the orifice of a lacuna, or some deeper part near to the neck of the bladder. In the former case it might and most probably would be *arterial*, usually relieved by pressure on the end of the penis; in the latter case, if very near the neck of the bladder, it would be *venous*, and must be controlled by cold applied to the perineum, or by placing ice in the rectum. The hæmorrhage which does come on as the result of division of a contracted urethra near to the glans penis may be avoided or rather anticipated by making the section of this part with a small bistoury guided by a director or by a very small urethrotome, Plate II., Fig. C, a few days previous to the greater operation, to secure beforehand for this part of the canal a capacity equal to at least a No. 12 English instrument, so that when the time arrives for the deep division of the canal by the urethrotome, the shielded portion of the instrument can travel easily along this part of the urethra without any further division. By this method, by first performing the minor operation, and after the interval of a few days the larger one, we are sure to be able to form a correct notion as to the possible source of the bleeding, and do not give our patient needless alarm, as he might suppose the blood came from parts more deeply situated than is really the case.

It is desirable before proceeding with the final operation that the bladder should contain a certain quantity of urine, so as to give room for the beak of the urethrotome when it enters the bladder, and also to

supply a test, by its escape along the groove in the shaft, that the instrument is rightly placed, and then when all is completed, and the larger bougie-à-ventre has been found to fully dilate the canal, a No. 14 English catheter should be used to empty the bladder; a morphia suppository should be placed in the rectum, so that if possible the patient may not require to urinate for four or six hours after the operation, and by this time, when he has recovered from the effects of the chloroform, any active hæmorrhage will have subsided, and he will most likely pass the urine in a good stream, just coloured with blood. Some smarting and pain may be present, but seeing that if no urine has passed over the surface for a few hours, it will most probably have become covered by coagulated blood, it will be protected from direct contact with the urine, and the pain experienced will not generally be very acute. No urethral tube or flexible catheter ought to be left in the bladder after this operation, as I have learnt by a good deal of experience in other similar cases, because where such an instrument is retained it interferes with the quiet deposition of blood-clot on those parts of the urethra which have been divided. It must be remembered that this method of using a knife protected by a sheath differs from Maisonneuve's method in the fact of its being only those parts of the mucous membrane and sub-mucous tissue of the tube that are cut through which correspond to the contracted portions. Where an unsheathed knife is used there is great danger of the urethra being divided not only where it has been contracted and is the least vascular, but also in other places; so that in the method I now advocate there will be only two or perhaps three spots in the urethra where a clot of blood will be so deposited over the cut surface. I have therefore adopted Mr. Teevan's recommendation not to pass any catheter into the bladder after the one used to empty it immediately after the operation, but on the third, or sometimes even the fifth day after the operation I pass a bougie-à-ventre of the size I have mentioned as corresponding to a No. 17 English, or if there is any doubt as to its passing readily, one of two sizes smaller, corresponding to an English No. 15 or 13. This I repeat after a second interval of five or perhaps six days, then for three times at an interval of a week, then after an interval of 14 and subsequently of 28 days, it being part of the system that having once secured a full incision, laceration, and dilatation of all the resisting fibres of the urethra, there is no fear of such an amount of contraction as to bring back the urethra to its previous abnormal dimensions. Yet there have been cases, and I have myself observed them, where from imperfect division at the time of this internal urethrotomy, or insufficient dilatation



immediately afterwards, re-contraction of the canal has slowly followed, and in these cases I have not hesitated to repeat the internal urethrotomy after some months, and eventually with the best ultimate benefit. It is upon this principle alone that we can look for permanency in the results of this operation, for if all the fibres have been thus divided or thoroughly torn through, there can be no fear of a relapse, especially if we accept the very ingenious assumption of Mr. Gouley that our object in thus dividing the urethra for the purpose of effecting a permanent cure of stricture can only be obtained by introducing, as it were, at some point of the contracted circumference of the tube, a "cicatricial splice" of new tissue originating in the organization of blood-clot, and serving in the expanse of mucous membrane, an office analogous to the transplantation of new skin in the vacuity of ulcers.

In carrying out this operation I always avail myself of the prophylactic action of quinine, combined in some form with opium, to avert the shock which is often impressed upon the nervous system, and the still more serious result which might follow—the absorption of deleterious matter from the newly-divided surfaces should suppuration supervene. The form in which I prefer to use this remedy is a pill containing two grs. of quinine with a little extract of gentian every three hours, washing it down with a draught containing about five drops of dilute sulphuric acid and five to ten drops of tincture of opium in an ounce of water. This medicine must be commenced as soon as the more direct effects of the chloroform have ceased, say at the end of six hours from the time of the operation, when it may be supposed that the soothing effects of the morphia suppository will have subsided. The reason I adopt this particular mode of giving quinine and opium is, that by giving quinine in the form of pill its extreme bitterness is not detected. I do not combine the opium with the quinine in the solid form, but give the opium in solution, so as to secure its immediate absorption, lest from a depressed condition of the system, either through the effects of the chloroform or from shock, digestion might be delayed,—the solid opium if given in repeated doses would accumulate in the stomach, and on the return of re-action too large a quantity might be suddenly absorbed and poisonous effects result.

I am also extremely careful after the operation to avoid anything like chill or cold, for in all operations upon the urethra attended by what has been called urethral fever—which, I take it, is but pyæmia in a modified form—the symptoms so frequently resemble those of rheumatism that it is very difficult to say in the early stage with which particular malady we are about to contend.

I am not prepared to draw any very fine comparison between this particular mode of dividing the urethra and other methods which have been employed from time to time by surgeons for what may be called the radical cure of stricture, and specially with Mr. Holt's plan of rapid forcible dilatation, in which the object is to tear through or split the strictured part; but it seems to me, having practised very largely Mr. Holt's plan, following his instructions as closely as possible both in the selection of cases and in the operation and its after-treatment, that internal urethrotomy with a cutting instrument acting on the face of the stricture and dividing only the contracted part, the healthy portions being uninjured, leaves the canal after such an operation in a much better and more natural state than after forcible laceration, where it very often happens, although perhaps not constantly, that it is not the hardened ring of new tissue which gives way, but rather the softer, more yielding structures in its immediate neighbourhood. For I have frequently observed at long intervals after a stricture has been thus torn through, that each time a catheter was passed there was still a very perceptible roughness and crookedness in the line of the urethral passage which compared very unfavourably with its perfect smoothness and straightness after Mr. Teevan's method; so much so that in several cases I have found, many weeks after this latter operation, that a solid bougie-à-ventre passed along the urethra meets with so little resistance that it will follow the line of the passage and enter the bladder by its own weight.

I am quite aware that it may be objected to this form of urethrotomy that it is not a perfect operation, and that the line of section is not really made at each stricture in the line or exact spot of the cicatrix to which we say the stricture is due; but it is a cut in the longitudinal axis of the urethra, not transversely made,—a simple incised wound well protected from the air in a closed passage the walls of which are constantly in apposition; and assuming that ordinary precautions have been taken in the use of well-oiled instruments freed from any source of blood contamination, such a wound will not be liable to inflame unduly, and the action of repair within it will not exceed the stage of plastic offusion. It is in this way I would explain the little local irritation which succeeds this form of urethrotomy, and the fact that by not inflaming the wound unduly by the presence of a catheter retained after the operation, we avoid one great source of irritation, suppuration, and pain. If there be several strictures—and I have assumed the contracted part of the urethra is not on the same side of the urethra at each stricture—it is impossible that each cicatrix

can come within reach of the knife of the urethrotome. But this most assuredly need not vitiate the results of the operation, seeing that the treatment of strictures by gradual dilatation may be likened to a stretched and elastic ring more or less extended, which will slowly to some degree recover its former dimensions, unless the extending force has been very long preserved. But take this same ring and break it or cut it at any one spot of its circumference: it will then resemble the effects of urethrotomy, and thus it will be apparent, in addition to the extensibility still spread over the length of the ring, that it will unfold itself at the point divided to an unlimited degree.

Some of the contracted spots of old cicatrices in the urethral walls will doubtless still remain untouched after the upper section of the canal, but here expansion will be secured over the line of the wound, and the entire circumference being restored, it is preserved to a certain degree by new tissue there deposited. It may be said that this new tissue may in turn be the subject of the same inevitable contraction which took place in the assumed ulcerated spots which caused the first malady; but antiseptic surgery has shown, and likewise sub-cutaneous surgery, which is but another phase of it, that the tendency to contract exhibited by the cicatrices of wounds is most frequently seen in wounds which have healed after excessive inflammation; for if the inflammatory changes, with all their consequences, have been restrained in the process of repair, the plastic matter is less of the nature of simple fibrous tissue, and more akin to the true structure of the part. Pliable cicatrices after burns treated antiseptically, and soft loose cicatrices in stumps after amputation, similarly managed, are matters of daily observation to those who practise antiseptic surgery. In this way I would justify the hope we have that a stricture divided after the fashion now described will never again contract below the measure of the healthy part,—the wound at the time of its infliction being stretched far beyond its ultimate requirements, and the new tissue by which it is to be filled up being soft and yielding. But here I must mention a great peculiarity in the condition sometimes observable in the urethra after internal urethrotomy, the precise cause of which I was only able to determine after much thought. I have only observed it in those cases of severe tightly contracted strictures associated with the presence of much plastic matter in and about the perineum previous to the operation. Of course the cases in which there are many fistulæ would be examples of those to which I now refer. I have noted that after internal urethrotomy in such cases there was for a long time subsequent to the operation some difficulty in passing



a large instrument along the urethra or an ordinary silver catheter, although a flexible gum-elastic instrument would travel easily. The explanation is this: previous to the section, the line of the urethra was pushed powerfully to one or the other side, or perhaps flattened by the dense hardened tissue in which the urethra often seems to be imbedded in such cases. In this way the tube of the urethra was tortuous to some degree—it was divided while so displaced by the knife of the urethrotome, cutting exactly straight, and so it would be left directly the operation was done, and while the larger bougie passed along it. But slowly, the sinuses healing and the indurations subsiding, weeks, it may be months, after the urethrotomy, the soft urethral tube falls back into its normal position in the perineum from which it has been displaced. Now no longer will the line of the several incisions quite correspond; there will seem to be irregularities and roughness in the canal—a flexible catheter will pass when a rigid metallic instrument cannot—showing that there is no diminished capacity in the tube, but only a want of straightness in its direction. Now, with this state of things, the exit of urine from the bladder is as free as ever. The only cure for this condition which I have found serviceable in two cases which I have so treated, is to repeat the internal urethrotomy, not to divide ring-like contractions, but to correct once for all these abnormal flexuosities.

Yet internal urethrotomy, under any circumstances, is not an operation to be lightly undertaken, the two dangers to be looked for being hæmorrhage and purulent infection. The latter may be avoided, I am of opinion, by never operating while there is a distinctly purulent discharge from the urethra, although perhaps the muco-purulent might not be so serious, yet even in that case some additional risk would exist;—by always being sure that the instruments we use are perfectly clean, no old blood or matter being deposited in the grooves of the urethrotome, and taking care that every instrument at the moment of use is well smeared with carbolated oil, about  $\frac{1}{16}$ th or  $\frac{1}{20}$ th in strength, not so strong as to irritate the mucous membrane of the urethra, and yet powerful enough to prevent any septic change; and then for the hæmorrhage, as I have already said, the avoidance of this is best secured on the principle that to be forewarned is to be fore-armed. It is likely to occur either from the front of the urethra where the orifice is narrow (either naturally or as a consequence of inflammation), or it may arise from the deeper portions of the passage where the veins and venous sinuses of the prostate have been previously distended to an inordinate degree.

There is one possible source of deep hæmorrhage in internal

urethrotomy which I think may occur occasionally, and of which I believe I have seen one example. It can only happen in cases of old neglected stricture, in which forcible catheterism with metallic instruments has been employed, and one or more false passages have been produced through the substance of the prostate gland, or by the side of it, which have served as channels for the escape of urine, and these may not depart greatly from the normal line of the urethra. In front of them, in the bulbo-membranous, or even in the anterior spongy part of the urethra, there may be a fine stricture on which we have expended much patience in securing slow but partial dilatation. The time arrives for the performance of the operation, the grooved guide for the urethrotome is passed through the narrowed portion of the urethra, and this being done, it slides easily into the bladder, and that it has reached that part is proved by the escape of drops of urine at the mouth of the urethra; and so the operator is compelled to be content that all is safe for the free section of the upper wall of the urethra, whereby any obstruction may be removed by the knife of the instrument. This, of course, he will do in the front stricture without risk, but just as he pushes the shielded portion of the urethrotome close to the neck of the bladder, a certain amount of resistance is present, which should not exist if we had to deal only with the prostatic portion of the urethra, which is naturally so expansible that it is said never to be the seat of organic stricture. It is needful, nevertheless, to use the urethrotome knife before the sheathed part of the instrument, which will be equal to the capacity of a No. 12 catheter, will pass into the bladder, because the instrument is really not in the dilatable prostatic portion of the urethra, but in an old unyielding false passage; and in this way a cut surface of prostatic tissue is produced, more vascular and more full of venous sinuses than one made in the upper central line of the gland, even if any section had there been required. I know not how this complication is to be avoided, except by noting very carefully in any similar case where the shields are arrested, if this be anywhere very near to the neck of the bladder; then withdrawing the whole instrument for a time, we ought to be able to pass a large silver catheter over the previously strictured portions through the prostate into the bladder, for in so doing a large instrument would not enter the orifice of such a false passage, although the smaller beak of the urethrotome-guide might have done so, and thus any division of prostatic tissue would be prevented, as it would be proved to be unnecessary.



These false passages are very common in old cases of stricture where the urethra has been ploughed up and damaged by many attempts at forcible catheterism.

Moreover there are two forms of stricture to which internal urethrotomy is peculiarly applicable;—one in which, the passage having become tightly contracted by such causes as I have already indicated, the most persevering attempts to dilate it by gradual mechanical means entirely fail; while the other is of an opposite nature,—the strictured portion of the urethra is freely dilatable, it can be stretched by bougies of increasing calibre until a very large one is admitted; but no sooner do we cease such mechanical dilatation but the contraction as certainly returns, and either through the physical elasticity of the part, or by recurrent congestion, the stricture relapses to its former contracted state. This is the elastic stricture, the congested and inflammatory stricture of some authors, and the subject of it is doomed through life to have an instrument passed at regular intervals, so as to sustain the size of the canal, or to learn to be his own surgeon and pass it himself. In both these kinds of stricture I think internal division by urethrotomy will be found very useful.

Lastly, I may remark that my own experience of this plan of internal urethrotomy, and the details thereof as at present described, is such that I feel great confidence in commending it to the attentive consideration of those surgeons who are anxious to get rid of the opprobrium so often attached to the treatment of stricture, “that it is a condition of things for which there is no “permanent cure;” while to those who would doubt the efficiency of this operation or the permanency of its results, or who from old prejudices still cling to the ancient method of repeated dilatation in this tedious surgical disease, I would simply say—“Give the “operation an honest trial, and let your strictures cease.”

